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## Analytical Paper

### Insights on the Canadian Economy

# The Terms of Trade and Domestic Spending

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Comments from John Baldwin and Guy Gellatly are greatly appreciated.

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## ***Abstract***

This paper empirically illustrates the impact of ongoing changes to Canada's terms of trade. It provides a discussion of how the terms of trade are measured and how to interpret terms of trade shifts. Examples of two major factors affecting Canada's terms of trade are provided, followed by an empirical analysis of how the terms of trade improvements that began in early 2003 have affected consumption, investment and import activity. The paper concludes by illustrating why final domestic demand growth has outpaced real gross domestic product growth since 2003.

## ***Introduction***

As oil prices touch US\$100 per barrel, gold tops US\$800 an ounce and the dollar rises above parity, the terms of trade improvements that began in 2003 continue to affect the Canadian economy. The higher commodity prices, an appreciating exchange rate and a larger contribution to world trade from low-cost Asian manufacturers in countries like China mean that Canadians can purchase a larger volume of imported goods and services with their exports. This rising purchasing power is reflected in more consumption and investment in Canada as export and import volumes adjust to the new price regime.

The influence of the terms of trade on the Canadian economy has not received much attention as a source of change. Yet, these trends have had a major impact on consumption and investment in recent years. This paper examines the measurement and interpretation of the terms of trade, the factors that led to its recent change and the impact of this shift on the economy. Although the paper focuses on the terms of trade, incorporating changes in them into the analysis captures only part of a larger, ongoing restructuring the Canadian economy.

### **Measuring the terms of trade and their impact**

The terms of trade – the price of exports relative to the price of imports – are one of the least discussed sources of change in Canadian living standards. They determine the number of imports that each export can purchase. When the terms of trade rise, Canadians can turn their exports into more imports – in effect raising real incomes, and boosting domestic spending.

Terms-of-trade effects are often not well understood because their impact can only be fully recognized in inflation-adjusted data. Nominal estimates for gross domestic product (GDP) will not show an explicit effect from terms-of-trade changes because, in current dollars, their impact is subsumed in changes in the balance of net exports.

When inflation is accounted for, real GDP reflects the volume of output produced: when the volume of goods and services produced rises, real GDP rises. Because terms-of-trade changes affect the purchasing power of income, and not necessarily the volume of production, they do not necessarily lead to changes in real GDP.

An alternative measure, real gross domestic income (GDI), captures changes in purchasing power as well as production.<sup>1</sup> It deflates imports and exports using the same price index – in this case the final domestic demand (FDD) price index. In doing so, it allows changes in prices (the terms of trade) to affect real income. Real GDI, therefore, rises with the volume of production (the same as real GDP) and when price changes increase the purchasing power of Canadian income. The difference between real GDP and real GDI growth reflects the impact of terms-of-trade changes.

### **Interpreting terms of trade changes**

Terms-of-trade changes are more difficult to interpret than other sources of real income growth because they seem to appear from nowhere. Unlike increases in hours worked or productivity that come from tangible effects, terms-of-trade driven real income growth stems from changes in the price structure of traded goods. Because these changes stem from price movements, rather than input or output movements, they must be analyzed using inflation-adjusted data.

In the first quarter of 2002, Canada's terms of trade were 0.98. This means that 100 exports bought 98 imports. If prices remain unchanged, or grow at exactly the same rate, then 100 Canadian exports would always purchase 98 imports and the only way to raise real incomes would be through increasing inputs or productivity growth.

However, prices do change, and export prices grow at a different rate than import prices. From 2002Q1 to 2007Q2 export prices rose 8.0% while import prices fell 11.6%. As a result, Canada's terms of trade rose from 0.98 to 1.20, an increase of 22.3%. This means that in 2007Q2, for every 100 exports, Canadians can now purchase 120 imports. The purchasing power of Canadian earnings increased.

The terms-of-trade real income effect is often described as a wealth effect. However, this description is somewhat misleading. Changes in price structures affect sellers and buyers differently. Because they interact in markets, many possible outcomes stem from export and import price changes, not all of which change the real income of Canadians.

The key to understanding the terms-of-trade effect is that although 100 exports now buy 120 imports, Canadians do not necessarily want 120 imports. The terms of trade indicate how many imports Canadians could buy, not how many they actually purchase. The reason for the difference between possible and actual import purchases comes from different groups of people selling exports and buying imports.

An example makes the difference clearer. Picture an oil company in Calgary that sells oil to the United States. When the price of oil increases, the oil sold to the United States makes more money for the Canadian oil company and the incomes of its employees and owners rise. The exporter benefits from the price increase.

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1. See Macdonald (2007).

Now suppose there is a retailer who buys goods from China and sells them in Calgary. When oil prices rise, the exchange rate appreciates making Chinese goods cheaper (the Chinese yuan is essentially fixed to the US dollar). The retailer is able to buy the same number of toys, clothes, etc. for less money. The retailer can then pass along the lower cost to consumers. The importer and consumers benefit from the price decline.

When oil company employees go to the retailer, they have more income to spend and face lower prices. They, therefore, have several options. First, spend all their extra money on lower-priced goods. This will require the retailer to import more goods to meet the increased demand. Second, buy only the toys, clothes, etc. they originally intended to purchase. This will leave them with extra income for services such as restaurants meals or other goods like a new car or a bigger house, or for savings.

Although the oil exporter and retailer are directly affected by the price change because they are buying and selling goods on world markets, they are not the only ones affected by the terms-of-trade improvement. For example, a waiter in Calgary who buys toys, clothes, etc from the retailer also benefits when the price of these items falls. He can buy the toys and clothes he needs, and have money left over for extra purchases. While he may not have as much left over as the oil company employees whose pay went up, the waiter does see a benefit. Each dollar he earns buys him more goods and services, and just like the oil company employees, the extra income can be saved, spent on traded goods or on non-traded services.

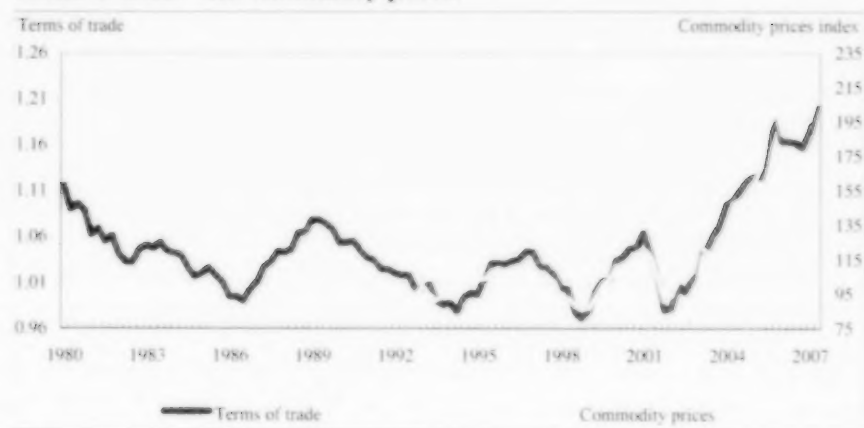
When the impact of rising commodity prices, falling consumer goods prices and the appreciating dollar are added up for all domestic spenders, the effect ultimately depends on what Canadians desire. As this paper shows, Canadians have desired more imported goods. But this does not mean that all extra income has been spent on traded goods: services and non-traded goods have also seen increased demand. Nor does it mean all the extra income has been spent – especially since businesses (which have contributed greatly to national saving since 2002) are also affected by the price changes.

The difference between the potential and actual terms of trade effect depends on the preferences of Canadians. The terms of trade calculation assumes a very rigid relationship between exports and imports, which appears reasonable when economic aggregates such as consumption or imports are analyzed. In fact, the economy has reacted quickly to changes in its terms of trade, raising imports much more quickly than exports. Nevertheless, the market interactions between exporters, importers and domestic agents suggest that terms of trade real income effects are more than just changes in wealth.

### **What factors affect the terms of trade?**

For Canada, the most important determinant of the terms of trade is commodity prices. When commodity prices rise or fall, the terms of trade follow suit because Canada is a net exporter of commodities like oil, metals and grains (Figure 1). Because the terms of trade are so closely linked to commodity prices, they have historically followed commodity price cycles. The most recent upward swing began in 2002 and saw a 123.4% increase in commodity prices between 2002Q1 and 2007Q2, driving Canada's terms of trade to new heights.

**Figure 1**  
**Terms of trade<sup>1</sup> and commodity prices**

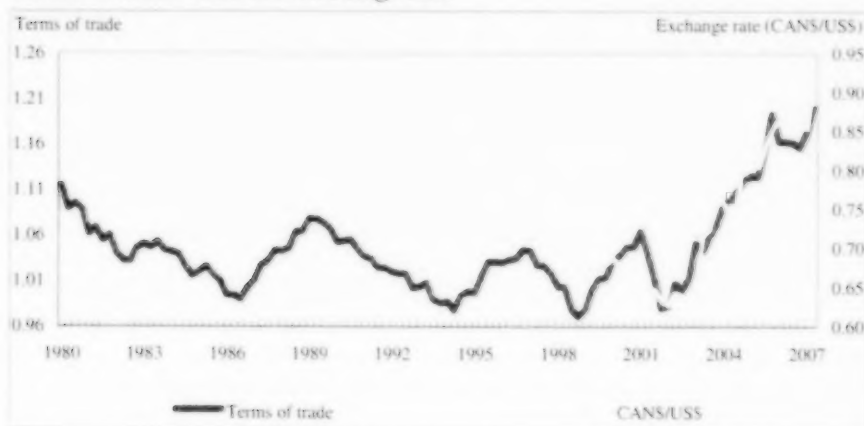


1. The price of exports relative to the price of imports.

Note: Author's calculations.

Source: Statistics Canada, CANSIM table 176-0001.

**Figure 2**  
**Terms of trade<sup>1</sup> and the exchange rate**



1. The price of exports relative to the price of imports.

Note: Author's calculations.

Source: Statistics Canada, CANSIM table 176-0049.

Commodity price changes can also have a direct impact on the Canada-US exchange rate. In fact, an exchange rate model developed by the Bank of Canada uses commodity prices as one of the key determinants of the value of the dollar.<sup>2</sup> When demand for Canadian commodities rises, the currency appreciates. Despite the link between commodity prices and the exchange rate, it is not the sole determinant. Differences in business cycles, economic circumstances, credit conditions, future expectations and differential domestic price movements also influence exchange rate movements, leading to additional terms-of-trade impacts.

The recent commodity-driven appreciation of the dollar has had important consequences for the distribution of terms-of-trade effect. In the absence of a link between commodity prices and the dollar, a rise in commodity prices is more narrowly focused, primarily affecting the resource industries by raising the value of their products, and the manufacturing industries by raising their input costs. Groups such as retailers or consumers do not see similar effects. However, when rising commodity prices pull the dollar along, they leverage the impact of commodity price-driven terms-of-trade shifts. As the dollar rises, the benefit of rising commodity prices is magnified and distributed across the whole economy.

Other determinants of Canada's terms of trade are productivity growth and the emergence of Asian manufacturing superpowers like China. Because prices generally reflect productivity changes, increasing productivity can hold back growth in traded-goods prices. Similarly, the emergence of low-cost Asian manufacturers has lowered prices for traded goods. This type of terms-of-trade improvement has been beneficial for Canada as falling machinery and equipment prices, particularly for computer products, have lowered import prices and raised the terms of trade. Canada has, in effect, imported productivity growth from the United States and, unlike commodity price driven terms of trade changes, which historically have been cyclical, productivity-driven changes are more likely permanent.

### **What is the impact of the recent terms-of-trade increase?**

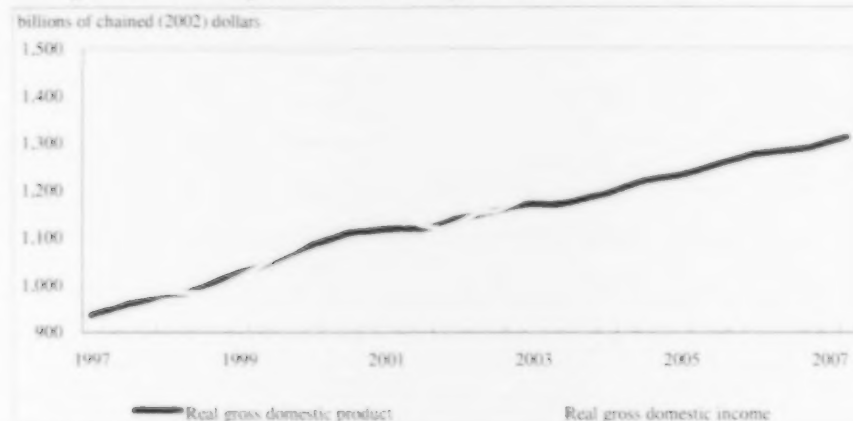
The terms-of-trade increase that began in 2002 has led to higher real income growth and higher growth in economic aggregates such as consumption, investment, exports and imports. The large improvement after 2002 manifests itself in several ways. First, real GDP growth lagged behind real GDI. Second, real import growth has been much stronger than export growth, implying that Canadians do, in fact, want more imported goods. Third, the volume of economic aggregates that depend on real income growth, like imports, consumption, investment and final domestic demand, are more closely related to real GDI growth than to real GDP growth.

From 2002Q1 to 2007Q2, real GDP growth lagged noticeably behind real GDI growth (Figure 3). The terms-of-trade improvement from rising commodity prices accounted for roughly one-third of real income growth in Canada during this period. From 2002Q1 to 2007Q2, real GDP rose by 15.1%, an average of 2.6% per year. Real GDI, fuelled by the commodity-price driven terms-of-trade improvement, rose by 23.0%, an average of 3.4% annually. The purchasing power of Canadian earnings (real GDI) increased 8 percentage points more than output (real GDP) because of the favourable changes in international prices.

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2. See Amano and van Norden (1993). Bailliu and King's article in the autumn 2005 *Bank of Canada Review* also provides a good discussion of exchange rate modelling.

**Figure 3**  
**Real gross domestic product and real gross domestic income**

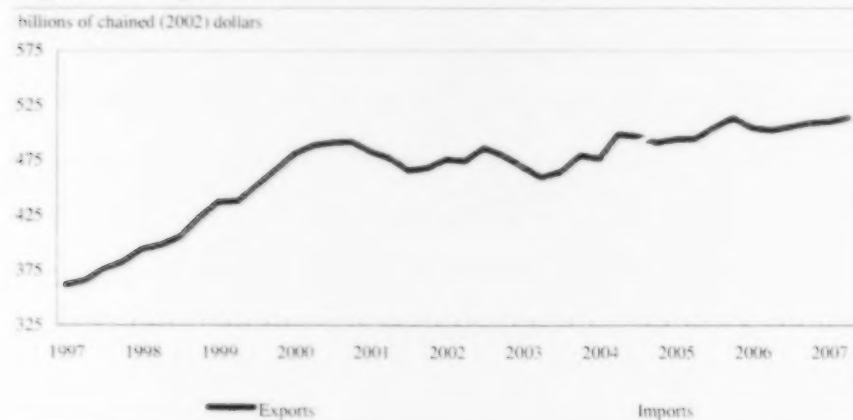


Note: Author's calculations.

Source: Statistics Canada, CANSIM table 380-0002.

When terms of trade improvements occur and Canadians want more foreign goods, the expectation is that import growth will greatly outpace output export growth. This is exactly the pattern observed (Figure 4). While exports increased by 7.9% between 2002Q1 and 2007Q2, export volumes in recent years have not greatly exceeded the peak levels seen in 2000. Import volumes, on the other hand, increased sharply. From 2002Q1 to 2007Q2 imports grew 36.8%, more than four times exports.

**Figure 4**  
**Export and import volumes**



Note: Author's calculations.

Source: Statistics Canada, CANSIM table 380-0002.

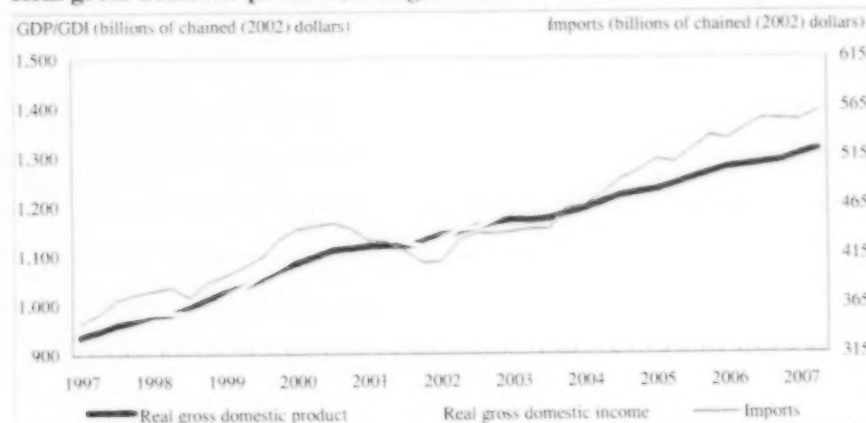


The impact of the terms-of-trade improvement is similarly evident when real GDP, real GDI and real import volumes are compared. When terms-of-trade changes are small, the trends of real GDP and real GDI are similar because changes in inputs and productivity are the dominant factors determining real income growth. Real GDP, which is the usual measure of real income growth, is then sufficient to understand domestic spending and imports.

However, when terms-of-trade changes contribute significantly to real income growth, as they have since 2002, import growth will appear strong relative to real GDP growth. Because real GDP captures output, not purchasing power, it will not rise enough to justify higher imports. As a result, an apparent disconnect will be seen between real income growth and real import growth when real GDP is used as a proxy for real income.

The disconnect is, however, not actually present. It stems from not recognizing the impact of terms-of-trade changes on purchasing power. When real GDI is used, the disconnect is reduced. Real imports rise by 36.8% between 2002Q1 and 2007Q2, roughly twice as much as real GDP at 15.1%. Real GDI, however, rose by 23.0%, only about one-third more than real GDP. As a result, the rise in imports more closely matches real GDI than real GDP (Figure 5).

**Figure 5**  
**Real gross domestic product, real gross domestic income and imports**



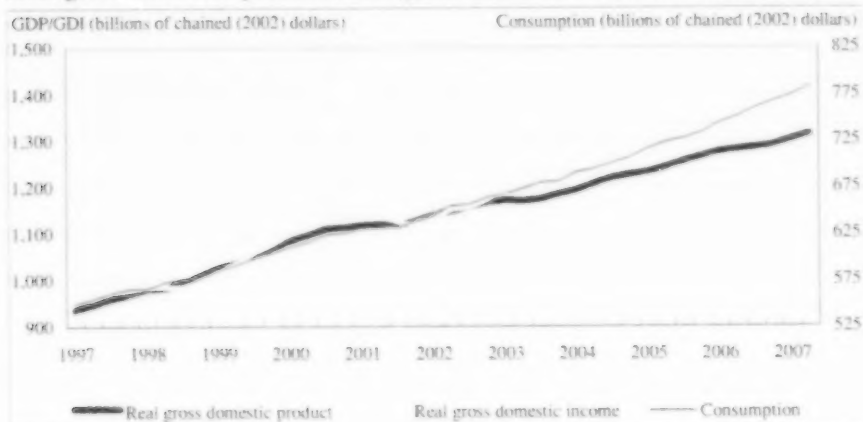
Note: Author's calculations.

Source: Statistics Canada, CANSIM table 380-0002.

A similar pattern is observed for consumption (Figure 6). Using real GDP as a measure of real income growth leads to consumption growth that is much stronger than would be implied by the rise in real GDP. Only when the rising purchasing power of Canadian income is accounted for can consumption growth be understood clearly. Real GDI and consumption moved similarly over time, rising 23.0% and 20.9% respectively. As with import growth, both outpaced real GDP which rose 15.1%.

**Figure 6**

**Real gross domestic product, real gross domestic income and consumption**



Note: Author's calculations.

Source: Statistics Canada, CANSIM table 380-0002.

The area where terms-of-trade changes are most visible is investment. Canada imports a large share of its machinery and equipment, so when the dollar appreciates and the terms of trade improve, investment becomes cheaper. It is reasonable to expect that firms will take advantage of the falling prices and upgrade their physical capital stock.

The appreciation of the dollar that contributed to the terms-of-trade improvement that began in 2002 encouraged investment (Figure 7). From 2002Q1 to 2007Q2, investment rose by 40%, roughly double the growth in real consumption or real GDI, and more than three times the growth of real GDP.

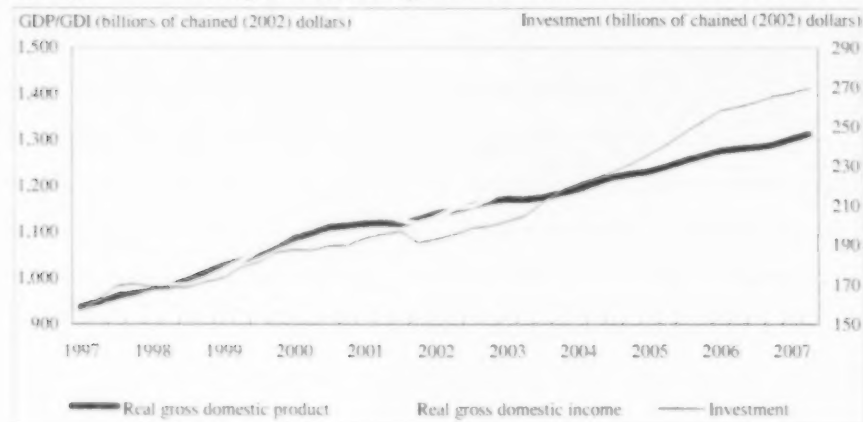
The cumulative effect of the rising terms of trade can also be found when real final domestic demand (FDD) is examined. FDD is a measure of demand that combines consumption, investment and government expenditures. When real GDP is compared with real FDD growth from 2002 to 2007, real FDD growth is noticeably stronger in most years. In fact, from 2003 through the first two quarters of 2007 it was significantly stronger.

However, once the contribution of the terms of trade to real income growth is incorporated, most of this faster growth can be explained. This is seen in Figure 8 by adding real GDP growth and the contribution from the terms of trade. The height of the combined bars equals real GDI growth, which is a much better indicator of real FDD growth than real GDP after 2002.<sup>3</sup>

3. While including the contribution to real income growth from the terms of trade accounts for much of the difference between real GDP and real final domestic demand (FDD) growth, additional factors can influence real incomes. An important contribution to real income growth in 2006 came from the roughly \$5 billion reduction in net income sent abroad in that year, as well as the approximately \$5 billion dollar repatriation of softwood lumber duties. These two sources of additional income are not accounted for when real GDI is examined.

**Figure 7**

**Real gross domestic product, real gross domestic income and investment**

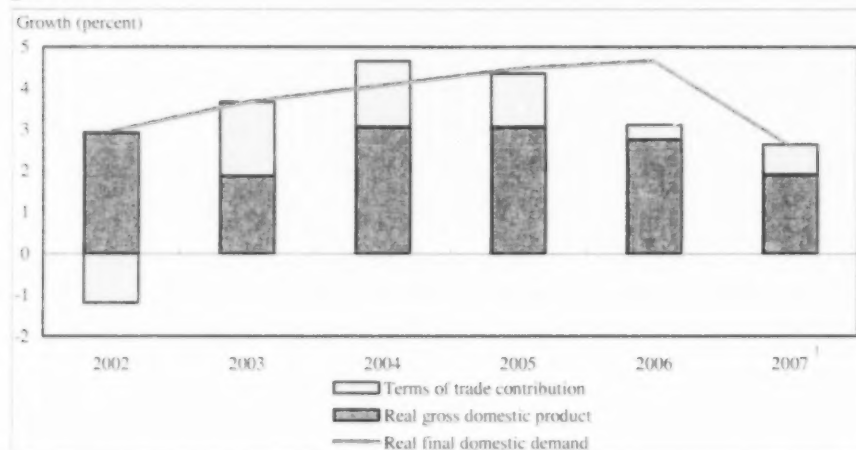


Note: Author's calculations.

Source: Statistics Canada, CANSIM table 380-0002.

**Figure 8**

**Real gross domestic product, terms of trade and real final domestic demand growth**



1. Year to date.

Note: Author's calculations.

Source: Statistics Canada, CANSIM table 380-0002.

## ***Conclusion***

Since 2002, rising commodity prices have boosted export prices, and the appreciating currency has leveraged their impact by lowering import prices. As well, there has been downward pressure on the international prices of many goods Canada imports due to the emergence of China as a manufacturing superpower. As a result, the terms of trade have risen 22.3%.

The increased terms of trade have contributed substantially to real income growth in Canada. Real GDP as a measure of real income misses this impact because it is only concerned with production. This is the appropriate procedure when studying changes in output or productivity.

However, for analyzing economic aggregates such as imports, consumption, investment or final domestic demand, real GDP underestimates real income growth when major changes occur in the terms of trade. In Canada, roughly one-third of real income growth from 2002Q1 to 2007Q2 was due to favourable movements in the terms of trade. A real income measure, such as real GDI, which incorporates terms of trade changes, is then required to understand the extent to which purchasing power has been increasing over the past five years.

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